Research on the impact of rural tourism on economic growth and employment level based on VAR model

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Abstract

In this paper, we use the time series model to analyze the impact of rural tourism to economic growth and employment rate. As rural tourism is a significant factor that will influence the regional economic growth and employment levels, so we make a statistical analysis of the impact of rural tourism growth (RTG), economic growth as gross domestic product (GDP) and tourism industry's employment rate (RET). The result shows that: First, rural tourism will promote GDP increase. LnRTG at lag 1 period increased one percentage can drive LnGDP increase by 0.871 percentage; Second, rural tourism will also have positive influence to employment rate. LnRTG at lag 1 period increased one percentage can drive LnRET growth by 0.026 percentages; Third, LnRTG is the granger reason to LnGDP, which means rural tourism growth is the reason to the economic growth. At the same time, LnRTG is also the reason to LnRET. In addition, the rural tourism has a certain contribution degree to economic growth and employment rate, and can be used to explain the rising of GDP and employment rate. On this basis, we put forward the related policy suggestion.

Keywords: rural tourism, economic growth, employment rate, causality test, impulse analysis

1 Introduction

Rura tourism is a new, modern alternative to the nature of the industry. It first appeared in China's rural areas in the 1980s, then began to be boomed, becoming the promotion of China's rural economic and social development and social building a new socialist countryside is an important force to be reckoned with. Into the 21st century, rural tourism is showing a strong momentum of development [1, 2]. Improve the level of economic development in rural areas, per capita income of rural residents to absorb and transfer of rural surplus labour; increase the added value of agriculture and animal husbandry industry to improve the living environment of rural residents has played a positive role in promoting [3]. Rural tourism is becoming rich in tourism resources, rural areas, farmers' income sources [4]. Compared with foreign countries, rural tourism in Europe and the United States and other developed countries has been nearly 200 years of rapid development, an important branch of the tourism industry [5]. Relevant theory and research of rural tourism is also becoming more mature.

Tourism has a very big influence on the economic and social development of the destination country or region. According to the World Tourism Organization (WTO) statistics, the overall ratio of the employment rate of increase in the tourism industry and the employment rate of society is about 1:5.The ratio of tourism increases output and related industries increased output value is 1:4.3. However, as a double-edged sword, the tourism industry not only has a positive impact on economic and social development of the destination country, but also has a negative impact [6-8]. For example, the development of tourism has a negative impact on the local natural ecological environment, three industrial structures and the local price [9-14]. Therefore, how to keep rational development and utilization of tourism resources and promote the sustainable development of tourism to the local economy and society has become a hot research topic [15].

This article starts from the basic concepts of tourism and the economic impacts of tourism, using the domestic and foreign economic impacts of tourism theory. On the base of lots of statistics and empirical analysis, Analyzing the impact the development of rural tourism to the local economy and society, and then put forward rational development, utilization the advantaged rural tourism resources, and promote the policies and recommendations of sustainable development of the local economic and social.

2 Materials and method

2.1 NONLINEAR VAR MODEL

We assume the VAR (Q) model as following:

$$\begin{bmatrix} y_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \gamma_1 \end{bmatrix} + \begin{bmatrix} \alpha_1 & \alpha_2 \\ \varphi_1 & \varphi_2 \end{bmatrix} \begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \ldots + \begin{bmatrix} e_1 \\ e_2 \end{bmatrix}. \quad (1)$$

In this Equation, Q is the lag augmentation of VAR model. We consider now that coefficients that determine causal relationships in the VAR (α2q and φ1q) are not stable but change over time following a logistic smooth transition functional form as:

$$\alpha_{2q} = a_{2q}^{*} + a_{2q}^{**} F\left(\lambda_{1q}, c_{1q}; \tau\right), \quad (2)$$

$$\alpha_{1q} = \varphi_{1q}^{*} + \varphi_{1q}^{**} F\left(\theta_{1q}, g_{1q}; \tau\right). \quad (3)$$

As the transition variable is time, c_{1q} and g_{1q} are

interpreted as the timing of the transition midpoint. The midpoint break date would simply be equal to (c_{1q} T+T/2) or (g_{1q} T+T/2). These timing coefficients can be determined endogenously through a grid search procedure, as will be discussed later on, so the researcher does not need to know the break point a priori.

An attractive feature of the VAR model (Equation 1) under definition (Equation (2) and (3)) is that it allows us to test a situation where a structural break has occurred in the causal relationships between the variables involved possibly due to a permanent shift in the data to a new regime induced by, for instance, a policy or a structural change in the economy. The transition towards the new regime may not be immediate but a smooth function whose speed of transition can be estimated. This is a plausible situation when the covariates' predictive power before the occurrence of a structural break is different from that after the break, but this change in predictive power takes time to occur. Ignoring the fact that the casual relationships are not stable over time but might change as a result of some structural breaks could lead to erroneous inferences.

We test for nonlinear granger causality from xt to yt using two different hypotheses:

$$H_0^1 : \alpha_{21}^* = \alpha_{22}^* = \ldots = \alpha_{2Q}^* = 0 , \quad (4)$$

$$H_0^2 : \alpha_{21}^* + \alpha_{21}^{**} = \alpha_{22}^* + \alpha_{22}^{**} = \ldots = \alpha_{2Q}^* + \alpha_{2Q}^{**} = 0 . \quad (5)$$

Equally, testing for granger causality from yt to xt, then we would have:

$$H_0^1 : \varphi_{11}^* = \varphi_{12}^* = \ldots = \varphi_{1Q}^* = 0 , \quad (6)$$

$$H_0^2 : \varphi_{11}^* + \varphi_{11}^{**} = \varphi_{12}^* + \varphi_{12}^{**} = \ldots = \varphi_{1Q}^* + \varphi_{1Q}^{**} = 0 . \quad (7)$$

The alternative in all these tests is that the sums of the coefficients are different from zero. Hypotheses H_0^1 (Equation (4) and (6)) and H_0^2 (Equation (5) and (7)) are tests for granger causality before and after the break respectively. The combination of these two tests allows us to address causality issues and analyze whether causal patterns have changed after the break. An advantage of these tests is that, for a given set of estimated parameters of the transition function, they can be carried out using standard F statistics. In practice, as will be discussed below, these tests take the form of F statistic. However, note that, under the null hypothesis H_0^2, the parameters of the transition function are not identified. Testing these hypotheses would only make sense if a smooth break exists. These identification issues are discussed in the next section.

2.2 ADF UNIT ROOT TEST

In this paper, we use STATA 12.0 software and make a statistical analysis of rural tourism growth (RTG), indicators of economic growth as gross domestic product (GDP) and tourism industry's employment rate (RET). All data was collected form China statistical yearbook and Chinese tourism bureau website. The data is from year 2000 to year 2013, and we undertook log processing to data, noted as LnRTG, LnGDP and LnRET. In order to analyze each variable's stationary, we use ADF unit root test to inspect LnRTG, LnGDP and LnRET, the result as is shown in Table 1. Through the test results we can see that all data are non-stationary. Then we calculate the difference of LnRTG, LnGDP and LnRET, and denoted as d.LnRTG, d.LnGDP and d.LnRET, results show that the two variable d.LnRTG, d.LnGDP and d.LnRET are stable, and then we can use granger test and cointegration test.

TABLE 1 Augmented Dickey–Fuller test (ADF)

Variable	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Result
LnRTG	-2.157	-3.750	-3.000	-2.630	Unstable
LnGDP	-1.691	-3.750	-3.000	-2.630	Unstable
LnRET	-2.258	-3.750	-3.000	-2.630	Unstable
d.LnRTG	-3.351	-3.750	-3.000	-2.630	Stable
d.LnGDP	-3.962	-3.750	-3.000	-2.630	Stable
d.LnRET	-3.644	-3.750	-3.000	-2.630	Stable

TABLE 2 Granger causality test

Equation	Excluded	chi2	df	Prob > chi2
LnRTG	LnGDP	15.968	2	0.012
LnGDP	LnRTG	26.812	2	0.001
LnRTG	LnRET	12.356	2	0.037
LnRET	LnRTG	20.573	2	0.251

TABLE 3 Johnson Co-integration test

Rank	Parms	LL	Characteristic Value	Statistic	5% Significant level
0	6	54.18489		22.5815	15.41
1	9	82.92402	0.74810	2.3514*	3.76

3 Results and discussion

3.1 VAR MODEL

Vector auto regression (VAR) is a statistical model used to capture the linear interdependencies among multiple time series. An estimated VAR model can be used for forecasting, and the quality of the forecasts can be judged. VAR model is the simultaneous form of autoregressive model, A VAR (p) model of a time series y (t) has the form:

$$A_0 y_{(t)} = A_1 y_{(t-1)} + \cdots + A_p y_{(t-p)} + \varepsilon_{(t)} . \quad (8)$$

In this paper, I use AIC, SC criterion to identify the lag length. From the result, we can get that the minimum AIC is in lag 2, so I choose lag 2 as the lag length. Then, we bulid the VAR model of LnRTG and LnGDP, LnRTG and LnRET as:

$$LnGDP = 0.368 + 0.871LnRTG_{t-1} + 0.247LnRTG_{t-2} + 1.042LnFIR_{t-1} + 0.859LnFIR_{t-2} \quad (9)$$

$$LnRET = -0.832 + 0.026LnRTG_{t-1} - 0.018LnRTG_{t-2} - 0.027LnRET_{t-1} + 0.036LnRET_{t-2} \quad (10)$$

According to the Equation (9), it can be seen that the rural tourism will promotes GDP increase. LnRTG at lag 1 period increased one percentage can drive LnGDP growth by 0.871 percentage, LnRTG at lag 2 period increased one percentage can drive LnGDP growth by 0.247 percentage, so the effect of rural tourism growth rate on gross domestic product growth is obvious. From Equation (10) we can get that rural tourism will also has positive influence to employment rate. LnRTG at lag 1 period increased one percentage can drive LnRET growth by 0.026 percentages of LnRTG at lag 2 period increased one percentage can drive LnRET decrease 0.018 percentage.

3.2 GRANGER TEST

Then, we use granger causality test to analyze this VAR model, the result is shown in Table 2. From Table 2, we can get that LnRTG is the granger reason to LnGDP, which means rural tourism growth is the reason to the economic growth. At the same time, LnRTG is also the reason to LnRET, so that rural tourism growth will also provide more employment opportunities.

At the same time, we take Johnson co-integration test to analyze the long-term relations between rural tourism and economic growth, the results is shown in Table 3. Co-integration is a statistical property of time series variables. Two or more time series are co integrated if they share a common stochastic drift, if two or more series are individually integrated but some linear combination of them has a lower order of integration, then the series are said to be co integrated.

According to the results, there exist at least one direct co-integration relationship between rural tourism and GDP, which means that there exist a long-term equilibrium relationship between rural tourism and economic growth.

3.3 IMPULSE-RESPONSE ANALYSIS

According to the results above, we can get that there exist a long-term equilibrium relationship between rural tourism and GDP, and rural tourism growth is the reason to the economic growth, also the VAR model is stable. In order to analyze the VAR model, we use Impulse-response function, the results is shown in Figure 1 and Figure 2.

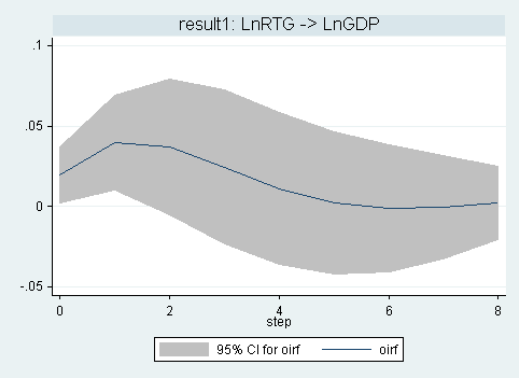

FIGURE 1 Impulse-response analysis for LnRTG to LnGDP

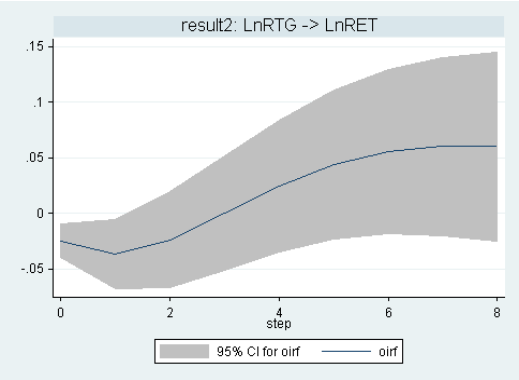

FIGURE 2 Impulse-response analysis for LnRTG to LnRET

From Figure 1 we can get that when LnRTG received one unit impact, it will lead LnGDP increase currently, LnGDP at t=1 period is 0.0195 and then increased to 0.0397 at t=2 period. Then LnGDP began to reduce and reach 0.011 at t=4 period. It illustrates there is long-term effect between rural tourism and economic growth. At the same time, from Figure 2 we can get that when LnRTG received one unit impact in, it will lead LnRET increase currently, LnRET is -0.036 at t=1 period and increase to 0.024 at t=4 period, then it become stable after t=7 period as 0.060. According to the impulse analysis results, we can get that rural tourism will significant influence the economic growth and employment, so that it is important to the local economy level.

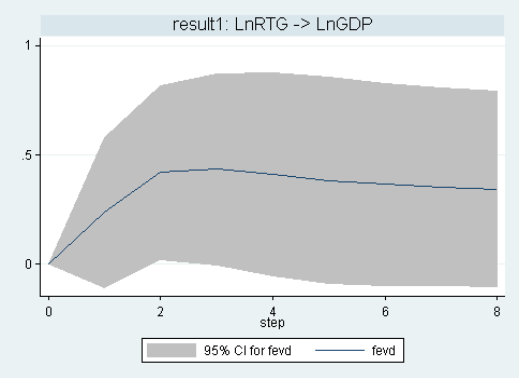

FIGURE 3 Cholesky variance decomposition for LnRTG to LnGDP

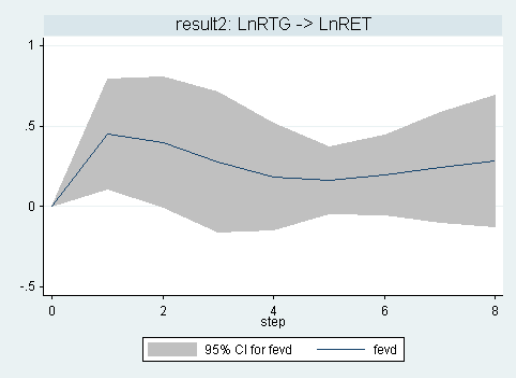

FIGURE 4 Cholesky variance decompositions for LnRTG to LnRET

Then, we make cholesky variance decomposition to the VAR model, the results is shown in Figure 3 and Figure 4. The cholesky variance decomposition also shows the same result, the contribution degree of LnRTG to LnGDP is gradually increased. From Figure 3 we find the contribution degree of LnRTG to LnGDP at t=1 period is 23.7%, and then increase to 42% at step 2, this means rural tourism has obvious interpretative strength to economic growth in the short-term. Then, the contribution degree of LnRTG to LnGDP increased gradually from step 2 and finally research to 34.5% at step 8. From the Figure 4 we can find that LnRTG has a good contribution degree to LnRET, contribution degree of LnRTG to LnRET is reached 44.7% at step 1, and then decreased 18.5% at step 2. This proves that the rural tourism have a certain contribution degree to employment rate. The result of variance decomposition means that rural tourism growth has an important contribution degree to the employment rate, and can be used to explain the rising of employment rate

4 Conclusions

This article starts from the basic concepts of tourism and the economic impacts of tourism, using the domestic and foreign economic impacts of tourism theory. On the base of lots of statistics and empirical analysis, Analyzing the impact the development of rural tourism to the local economy and society, and then put forward rational development, utilization the advantaged rural tourism resources, and promote the policies and recommendations of sustainable development of the local economic and social. From the empirical analysis, the result shows that: (1) rural tourism will promote economic growth. LnRTG at lag 1 period increased one percentage can drive LnGDP increase by 0.871 percentage; (2) rural tourism will also has positive influence to employment rate. LnRTG at lag 1 period increased one percentage can drive LnRET growth by 0.026 percentages; (3) LnRTG is the granger reason to LnGDP, which means rural tourism growth is the reason to the economic growth. At the same time, LnRTG is also the reason to LnRET.

In China although the rapid development of rural tourism, but in general, rural tourism is in fact still in its infancy, there are still many imperfect and immature, rural tourism research is in the initial stage of exploration. Overheating too fast due to the development of rural tourism, also appeared in a series of difficulties, affected or restricted the rural tourism and enhance the performance of these difficulties, these difficulties can not be resolved or are not properly solved, is bound to become the bottleneck of the development, but also for the sustainable development of rural tourism potential problems. Therefore, the study of rural tourism development difficulties and economic performance has important theoretical and practical significance.

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